

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~striketrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered). Please CANCEL claims 4, 5, 19 and 20 without prejudice or disclaimer, AMEND claims 1-3, 6-18 and 21-30 and ADD new claims 33-40 in accordance with the following:

1. (currently amended) An optical transmission system which transports optical signals over an optical transmission line, comprising:

(a) an optical transmitter, comprising:

an optical ~~amplifier~~ amplifying means that amplifies main signals, and
an optical ~~amplifier controller~~ amplifying control means that starts up said optical ~~amplifier~~ amplifying means, ~~spending waiting~~ a first predetermined time to raise output power of said optical ~~amplifier~~ amplifying means up to a desired level, in order to prevent an OSC signal from experiencing abrupt power variations,

wherein said optical amplifying control means includes a timer with a predetermined time constant that is enabled when the optical transmission system starts to operate, and

said optical amplifying control means starts to raise the output power of said optical amplifying means in a stepwise fashion after said timer has expired; and

(b) an optical receiver, comprising:

a pump light ~~source~~ that emitting means produces a pump ~~beam~~ light for injection to the ~~fiber~~-optic transmission line so as to make the ~~fiber~~-optic transmission line serve as an amplifying medium, and

a pump light ~~source controller~~ emitting control means that starts up said pump light ~~source~~ emitting means, ~~spending waiting~~ a second predetermined time to raise the pump ~~beam~~ light to a desired power level, in order to prevent the OSC signal from experiencing abrupt power variations, and

said pump light emitting control means starts to raise the pump light in a stepwise fashion after said timer has expired, whereby said pump light emitting means starts up later than said optical amplifying means.

2. (currently amended) The optical transmission system according to claim 1, further comprising a variable optical attenuator disposed before said optical ~~amplifier~~ amplifying means to vary input signal level thereof, wherein:

said optical ~~amplifier~~ amplifying means is controlled in both automatic level control (ALC)

and automatic gain control (AGC) modes;

said optical ~~amplifier controller~~amplifying control means controls said optical amplifier in the ALC mode to raise the output power thereof from zero level; and

after said optical ~~amplifier~~amplifying means has moved into the AGC mode, said optical amplifier controller controls the input signal level of said optical ~~amplifier~~amplifying means by varying attenuation level of said variable optical attenuator, thereby controlling the output power of said optical ~~amplifier~~amplifying means.

3. (currently amended) The optical transmission system according to claim 1, further comprising a variable optical attenuator disposed before said optical ~~amplifier~~amplifying means in said optical transmitter to vary input signal level thereof, wherein:

said optical ~~amplifier~~amplifying means is controlled in AGC mode; and

said optical ~~amplifier controller~~amplifying control means first sets a maximum attenuation level to said variable optical attenuator and then gradually reduces the attenuation level, thereby increasing the output power of said optical ~~amplifier~~amplifying means in a stepwise fashion.

4. (cancelled)

5. (cancelled)

6. (currently amended) The optical transmission system according to claim 1, wherein:

said optical transmitter sends a downstream OSC signal to said optical receiver to indicate that said optical amplifier controller has finished raising the output power of said optical ~~amplifier~~amplifying means; and

said pump light ~~source controller~~emitting control means starts to raise the pump ~~beam~~light in a stepwise fashion upon receipt of the downstream OSC signal.

7. (currently amended) The optical transmission system according to claim 1, wherein:

said optical receiver sends an upstream OSC signal to said optical transmitter to indicate that said pump light ~~source controller~~emitting control means has finished raising the pump ~~beam~~light; and

said optical ~~amplifier controller~~amplifying control means starts to raise the output power of said optical ~~amplifier~~amplifying means in a stepwise fashion upon receipt of the upstream OSC signal.

8. (currently amended) The optical transmission system according to claim 1, wherein said optical ~~amplifier-controller~~amplifying control means and said pump light ~~source~~controlleremitting control means respectively start up said optical ~~amplifier~~amplifying means and said pump light ~~source~~emitting means in an interactive way, communicating each other's ongoing process status by sending OSC signals back and forth.

9. (currently amended) The optical transmission system according to claim 1, wherein:

said optical receiver comprises a monitoring ~~controller~~control means that watches at least one of main signal power and OSC signal power;

said optical receiver sends an upstream OSC signal to notify said optical transmitter of monitoring results of said monitoring ~~controller~~control means; and

based on the monitoring results received from said optical receiver, said optical ~~amplifier controller~~amplifying control means calculates control step parameters for use in raising the output power of said optical ~~amplifier~~amplifying means in a stepwise fashion.

10. (currently amended) The optical transmission system according to claim 1, wherein:

said optical receiver comprises a monitoring ~~controller~~control means that watches at least one of main signal power and OSC signal power; and

based on monitoring results of said monitoring ~~controller~~control means, said pump light ~~source-controller~~emitting control means calculates control step parameters for use in raising the pump ~~beam-light~~ in a stepwise fashion.

11. (currently amended) The optical transmission system according to claim 1, wherein said optical transmitter and said optical receiver each comprise a mask time setting ~~unit~~means that defines and uses a mask time in checking incoming OSC signals in such a way that a substantial OSC error is detected only when OSC signal faults continue for a period longer than the mask time.

12. (currently amended) The optical transmission system according to claim 1, wherein said optical ~~amplifier-controller~~amplifying control means calculates control step parameters from the desired level of said optical ~~amplifier~~amplifying when raising the output power in a stepwise fashion.

13. (currently amended) The optical transmission system according to claim 1, wherein:

said optical ~~amplifier controller~~amplifying control means comprises a memory that stores control step parameters to achieve the desired level of said optical ~~amplifier~~amplifying means; and

said optical ~~amplifier controller~~amplifying control means reads out the control step parameters from said memory when raising the output power of said optical ~~amplifier~~amplifying means in a stepwise fashion.

14. (currently amended) The optical transmission system according to claim 1, wherein said pump light ~~source controller~~emitting control means calculates control step parameters from the desired power level of the pump ~~beam~~light when raising the pump ~~beam~~light in a stepwise fashion.

15. (currently amended) The optical transmission system according to claim 1, wherein:

said pump light ~~source controller~~emitting control means comprises a memory that stores control step parameters to achieve the desired power level of the pump ~~beam~~light; and

said pump light ~~source controller~~emitting control means reads out the control step parameters from said memory when raising the pump ~~beam~~light in a stepwise fashion.

16. (currently amended) An optical transmission system which transports optical signals between upstream and downstream stations over an optical transmission line, each station comprising:

an optical ~~amplifier~~amplifying means that amplifies main signals;

an optical ~~amplifier controller~~amplifying control means that starts up said optical transmitter, ~~spending waiting~~ a first predetermined time to raise output power of said optical ~~amplifier~~amplifying means up to a desired level, in order to prevent an OSC signal from experiencing abrupt power variations;

wherein said optical amplifying control means comprises a timer with a predetermined time constant that is enabled when the optical transmission system starts to operate, and

said optical amplifying control means starts to raise the output power of said optical amplifying means in a stepwise fashion after said timer has expired,

a pump light ~~source~~emitting means that produces a pump ~~beam~~light for injection to the fiber-optic transmission line so as to make the fiber-optic transmission line serve as an amplifying medium; and

a pump light ~~source controller~~ emitting control means ~~that~~ starts up said pump light ~~source~~ emitting means, ~~spending waiting~~ a second predetermined time to raise the pump beam light to a desired power level, in order to prevent the OSC signal from experiencing abrupt power variations,

wherein said pump light emitting control means comprises a timer with a predetermined time constant that is enabled when the optical transmission system starts to operate, and

said pump light emitting control means starts to raise the pump light in a stepwise fashion after said timer has expired, whereby said pump light emitting means in the downstream station starts up later than said optical amplifying means in the upstream station.

17. (currently amended) The optical transmission system according to claim 16, further comprising a variable optical attenuator disposed before said optical ~~amplifier~~ amplifying means to vary input signal level thereof, wherein:

said optical ~~amplifier~~ amplifying means is controlled in both ALC and AGC modes;

said optical ~~amplifier controller~~ amplifying control means controls said optical ~~amplifier~~ amplifying means in the ALC mode to raise the output power thereof from zero level; and

after said optical ~~amplifier~~ amplifying means has moved into the AGC mode, said optical ~~amplifier controller~~ amplifying control means controls the input signal level of said optical ~~amplifier~~ amplifying means by varying attenuation level of said variable optical attenuator, thereby controlling the output power of said optical ~~amplifier~~ amplifying means.

18. (currently amended) The optical transmission system according to claim 16, further comprising a variable optical attenuator disposed before said optical ~~amplifier~~ amplifying means to vary input signal level thereof, wherein:

said optical ~~amplifier~~ amplifying means is controlled in AGC mode; and

said optical ~~amplifier controller~~ amplifying control means first sets a maximum attenuation level to said variable optical attenuator and then gradually reduces the attenuation level, thereby increasing the output power of said optical ~~amplifier~~ amplifying means in a stepwise fashion.

19. (cancelled)

20. (cancelled)

21. (currently amended) The optical transmission system according to claim 16, wherein:

said optical ~~amplifier controller~~ amplifying control means in the upstream station sends a

downstream OSC signal to the downstream station to indicate that said optical ~~amplifier controller~~amplifying control means has finished raising the output power of said optical ~~amplifier~~amplifying means; and

in the downstream station, said pump light ~~source controller~~emitting control means starts to raise the pump ~~beam~~light in a stepwise fashion upon receipt of the downstream OSC signal.

22. (currently amended) The optical transmission system according to claim 16, wherein:

said pump light ~~source controller~~emitting control means in the downstream station sends an upstream OSC signal to the upstream station to indicate that said pump light ~~source controller~~emitting control means has finished raising the pump ~~beam~~light; and

in the upstream station, said optical ~~amplifier controller~~amplifying control means starts to raise the output power of said optical ~~amplifier~~amplifying means in a stepwise fashion upon receipt of the upstream OSC signal.

23. (currently amended) The optical transmission system according to claim 16, wherein said optical ~~amplifier controller~~amplifying control means and said pump light ~~source controller~~emitting control means in the upstream and downstream stations respectively start up said optical ~~amplifier~~amplifying means and said pump light ~~source~~emitting means in an interactive way, communicating each other's ongoing process status by sending OSC signals back and forth.

24. (currently amended) The optical transmission system according to claim 16, wherein:

each station further comprises a monitoring ~~controller~~control means that watches at least one of main signal power and OSC signal power;

the downstream station sends an upstream OSC signal to notify the upstream station of monitoring results of said monitoring ~~controller~~control means; and

in the upstream station, said optical ~~amplifier controller~~amplifying control means calculates control step parameters, based on the monitoring results received from the downstream station, for use in raising the output power of said optical ~~amplifier~~amplifying means in a stepwise fashion.

25. (currently amended) The optical transmission system according to claim 16, wherein:

each station further comprises a monitoring ~~controller~~control means that watches at

least one of main signal power and OSC signal power; and

said pump light ~~source-controller~~emitting control means calculates control step parameters, based on monitoring results provided by said monitoring ~~controller~~control means, for use in raising the pump ~~beam~~light in a stepwise fashion.

26. (currently amended) The optical transmission system according to claim 16, wherein each station further comprises a mask time setting ~~unit~~means that defines and uses a mask time in checking incoming OSC signals in such a way that a substantial OSC error is detected only when OSC signal faults continue for a period longer than the mask time.

27. (currently amended) The optical transmission system according to claim 16, wherein said optical ~~amplifier-controller~~amplifying control means calculates control step parameters from the desired level of said optical ~~amplifier~~amplifying means when raising the output power in a stepwise fashion.

28. (currently amended) The optical transmission system according to claim 16, wherein:

said optical ~~amplifier-controller~~amplifying control means comprises a memory that stores control step parameters to achieve the desired level of said optical ~~amplifier~~amplifying means; and

said optical ~~amplifier-controller~~amplifying control means reads out the control step parameters from said memory when raising the output power of said optical ~~amplifier~~amplifying means in a stepwise fashion.

29. (currently amended) The optical transmission system according to claim 16, wherein said pump light ~~source-controller~~emitting control means calculates control step parameters from the desired power level of the pump ~~beam~~light when raising the pump ~~beam~~light in a stepwise fashion.

30. (currently amended) The optical transmission system according to claim 16, wherein:

said pump light ~~source-controller~~emitting control means comprises a memory that stores control step parameters to achieve the desired power level of the pump ~~beam~~light; and

said pump light ~~source-controller~~emitting control means reads out the control step parameters from said memory when raising the pump ~~beam~~light in a stepwise fashion.

31. (withdrawn) A method of suppressing temporary OSC signal errors, comprising the steps of:

starting up an optical amplifier, spending a first predetermined time to raise output power of the optical amplifier up to a desired level, in order to prevent an OSC signal from experiencing abrupt power variations, wherein the optical amplifier is a device that amplifies main signals; and

starting up a pump light source, spending a second predetermined time to raise a pump beam to a desired power level, in order to prevent the OSC signal from experiencing abrupt power variations, wherein the pump light source is a device that produces the pump beam for injection to a fiber-optic transmission line so as to make the fiber-optic transmission line serve as an amplifying medium.

32. (withdrawn) The method according to claim 31, wherein said steps of starting up the optical amplifier and pump light source are executed at different times.

33. (new) An optical transmission system comprising:

(a) an optical transmitter comprising:

an optical amplifier that amplifies main optical signals for transport over a downstream fiber-optic transmission line, and

an optical amplifier controller that raises output power of said optical amplifier up to a desired level in a stepwise fashion; and

(b) an optical receiver comprising:

a pump light source that produces a pump beam for injection to the downstream fiber-optic transmission line so as to cause Raman amplification,

a pump light source controller that raises the pump beam to a desired power level in a stepwise fashion,

a monitoring controller that monitors power levels of at least one of incoming main optical signals and an incoming optical supervisory signal, and

an optical supervisory signal transmitter that transmits a monitoring result of said monitoring controller by using an optical supervisory signal over an upstream fiber-optic transmission line;

wherein the number and interval of steps in the stepwise raising of the output power of said optical amplifier are determined based on the monitoring result.

34. (new) An optical transmission system comprising:

(a) an optical transmitter comprising:

an optical amplifier that amplifies main optical signals for transport over a downstream fiber-optic transmission line, and

an optical amplifier controller that raises output power of said optical amplifier up to a desired level in a stepwise fashion; and

(b) an optical receiver comprising:

a pump light source that produces a pump beam for injection to the downstream fiber-optic transmission line so as to cause Raman amplification,

a pump light source controller that raises the pump beam to a desired power level in a stepwise fashion, and

a monitoring controller that monitors power levels of at least one of incoming main optical signals and an incoming optical supervisory signal;

wherein the number and interval of steps in the stepwise raising of the pump beam are determined based on the monitoring result.

35. (new) An optical transmission system comprising:

(a) an optical transmitter comprising:

an optical amplifier that amplifies main optical signals for transport over a downstream fiber-optic transmission line, and

an optical amplifier controller that raises output power of said optical amplifier up to a desired level in a stepwise fashion; and

(b) an optical receiver comprising:

a pump light source that produces a pump beam for injection to the downstream fiber-optic transmission line so as to cause Raman amplification,

a pump light source controller that raises the pump beam to a desired power level in a stepwise fashion,

a monitoring controller that monitors power levels of at least one of incoming main optical signals and an incoming optical supervisory signal, and

an optical supervisory signal transmitter that notifies said optical transmitter of completion of the stepwise raising of the pump beam by sending an optical supervisory signal over an upstream fiber-optic transmission line;

wherein the number and interval of steps in the stepwise raising of the output power of said optical amplifier and in the stepwise raising of the pump beam are determined based on the monitoring result.

36. (new) An optical transmission system comprising:

(a) an optical transmitter comprising:

an optical amplifier that amplifies main optical signals for transport over a downstream fiber-optic transmission line, and

an optical controller that raises output power of said optical amplifier up to a desired level in a stepwise fashion; and

(b) an optical receiver comprising:

a pump light source that produces a pump beam for injection to the downstream fiber-optic transmission line so as to cause Raman amplification,

a pump light source controller that raises the pump beam to a desired power level in a stepwise fashion,

a monitoring controller that monitors power levels of at least one of incoming main optical signals and an incoming optical supervisory signal, and

an optical supervisory signal transmitter that transmits a monitoring result of said monitoring controller by using an optical supervisory signal over an upstream fiber-optic transmission line;

wherein the number and interval of steps in the stepwise raising of the output power of said optical amplifier and in the stepwise raising of the pump beam are determined based on the monitoring result, and

wherein said optical amplifier controller and said pump light source controller start up said optical amplifier and said pump light source, respectively, while exchanging each other's ongoing process status by sending optical supervisory signals back and forth upstream and downstream transmission lines.

37. (new) A method of suppressing optical supervisory signal errors, comprising:
raising output power of an optical amplifier up to a desired level in a stepwise fashion, the optical amplifier being disposed in an optical transmitter to amplify main optical signals for transport over a downstream fiber-optic line;

raising a pump beam to a desired power level in a stepwise fashion, the pump beams being produced by a pump light source disposed in an optical receiver for injection to the downstream fiber-optic transmission line so as to cause Raman amplification;

monitoring power levels of at least one of an incoming main optical signal and an incoming optical supervisory signal that the optical receiver receives;

transmitting the result of said monitoring from the optical receiver to the optical transmitter by using an optical supervisory signal over an upstream fiber-optic transmission line;
and

determining the number and interval of steps in said stepwise raising of the output power of the optical amplifier, based on the result of said monitoring.

38. (new) A method of suppressing optical supervisory signal errors, comprising:
raising output power of an optical amplifier up to a desired level in a stepwise fashion, the optical amplifier being disposed in an optical transmitter to amplify main optical signals for transport over downstream fiber-optic transmission line;
raising a pump beam to a desired power level in a stepwise fashion, the pump beams being produced by a pump light source disposed in an optical receiver for injection to the downstream fiber-optic transmission line so as to cause Raman amplification;
monitoring power levels of at least one of an incoming main optical signal and an incoming optical supervisory signal that the optical receiver receives; and
determining the number and interval of steps in said stepwise raising of the pump beam, based on the result of said monitoring.

39. (new) A method of suppressing optical supervisory signal errors, comprising:
raising output power of an optical amplifier up to a desired level in a stepwise fashion, the optical amplifier being disposed in an optical transmitter to amplify main optical signals for transport over a downstream fiber-optic transmission line;
raising a pump beam to a desired power level in a stepwise fashion, the pump beams being produced by a pump light source disposed in an optical receiver for injection to the downstream fiber-optic transmission line so as to cause Raman amplification;
monitoring power levels of at least one of an incoming main optical signal and an incoming optical supervisory signal that the optical receiver receives;
notifying the optical transmitter of completion of said stepwise raising of the pump beam by sending an optical supervisory signal over an upstream fiber-optic transmission line; and
determining the number and interval of steps in said stepwise raising of the output power of the optical amplifier and in said stepwise raising of the pump beam, based on the result of said monitoring.

40. (new) A method of suppressing optical supervisory signal errors, comprising:
raising output power of an optical amplifier up to a desired level in a stepwise fashion, the optical amplifier being disposed in an optical transmitter to amplify main optical signals for transport over a downstream fiber-optic transmission line;
raising a pump beam to a desired power level in a stepwise fashion, the pump beams being produced by a pump light source disposed in an optical receiver for injection to the downstream fiber-optic transmission line so as to cause Raman amplification;
monitoring power levels of at least one of an incoming main optical signal and an

incoming main optical supervisory signal that the optical receiver receives;

transmitting the result of said monitoring from the optical receiver to the optical transmitter by using an optical supervisory signal over an upstream fiber-optic transmission line; and

determining the number and interval of steps in said stepwise raising of the output power of the optical amplifier and in said stepwise raising of the pump beam, based on the result of said monitoring;

wherein the sending end and receiving end perform said stepwise raising of the output power and pump beam, respectively, while exchanging each other's ongoing process status by sending optical supervisory signals back and forth over the upstream and downstream transmission lines.